



WHAT IS AN REU?

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Research Experiences for Undergraduates (REUs) are internship programs run with the intent of engaging undergraduate students in science through involvement in mentored research, professional development, and a sense of cohort with peers. The Directorate for Geosciences in the National Science Foundation funds several [REU programs](#) in the ocean sciences, atmospheric and geospace sciences, Earth sciences and polar programs.

Whether you are writing a [grant proposal to NSF](#) or refreshing plans for next year's REU program, this chapter is intended to help with your planning.

➔ What is an REU?

The Research Experiences for Undergraduates (REU) Program is a signature National Science Foundation program for students to have the chance to experience and engage in doing their own research. Dalbotten et al. state that:

“Anecdotal evidence indicates that the REU program has been notably successful in providing hands-on experience and cooperative learning—both in the field and also in the laboratory. It has attracted numerous young people to the geosciences, including many from underrepresented groups, and has also proven to be an important cornerstone for many others who have gone into other professional fields.”

Students do a research project with a mentor or team from start to finish, connect with peers, and gain professional skills like communicating effectively. Most students who participate in an REU say that they find it to have been extremely worthwhile.

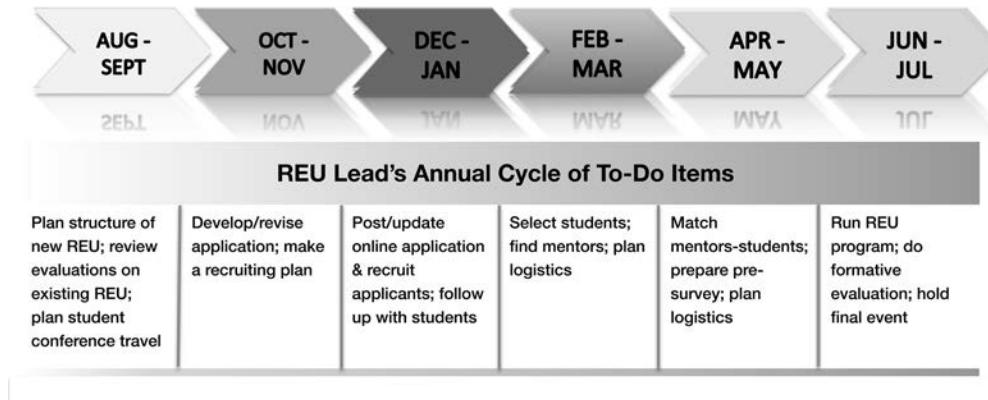
Typical elements of an REU

An REU usually involves:

- » A 7 - 10 week, paid, hands-on, summer work experience in a research environment
- » Cohort-building amongst undergraduates interested in the same field
- » Working under the mentorship of a scientist or team
- » Learning skills such as field or lab techniques, or computer modeling
- » Analyzing data and interpreting results
- » Learning scientific communication through presenting a poster or talk locally, virtually, or possibly traveling to a conference
- » Exposing students to a whole new world of science

REU Timeline

Most REU programs follow a similar timeline, shown in the figure below:



➔ Planning a Research Experiences for Undergraduates

Planning for an REU should ideally begin before the proposal is written. Maybe you are writing a new grant or are taking over an existing one. Here are some crucial tasks for successful REUs that may be easily overlooked if not discussed upfront:

1. Design an exciting, workable research experience program that will be engaging to students.
2. Make sure you have adequate logistical resources and support so that your program will work. Think about issues like communicating with mentors, travel arrangements, housing, sharing about the program through social media and articles, and more.
3. Create a good research environment that is safe and friendly. Make sure you are making your program accessible. Issues to consider would include diversity and inclusion, accessibility, and preventing harassment of any kind, including sexual harassment.
4. Build in mentoring that supports students not only scientifically but holistically.
5. Think how you will build camaraderie in the program with things like icebreakers, orientations, setting and communicating expectations, and working in collaborative teams.



History of the REU Program

“At some universities, research experiences have always been a part of the undergraduate experience, both informally and in formal programs. Historically, students have participated in these programs at their home institutions where a single student is placed into the laboratory of a faculty member. They relied on a strong university research program, faculty with time to oversee the student’s research, and a student with the willingness to seek out, or request access to, the opportunity. In 1958, NSF began to foster these experiences through the Undergraduate Research Program (URP).

“This program allowed universities to competitively apply for funding to host teams of students in a summer research program. Research that followed confirmed the value of these experiences for promoting students to participate in STEM and to move on to graduate programs. In 1978 the Council for Undergraduate Research (CUR) was formed to promote research opportunities as an integral part of the undergraduate experience [CUR, 2009]. The URP was suspended in 1978 for review, and then replaced by the REU program in 1987 [Schowen, 2002].

“Today, the REU program and other research programs sponsored through organizations such as National Institutes for Health (NIH), National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), and US Geological Survey (USGS) have created myriad summer research programs for hundreds of undergraduate students every year. Although the mentoring skills and enthusiasm of the research advisor are still a key element of the quality of the experience, a variety of supports have been added to programs, including writing support, library tutorials, ethics programs, Graduate Record Examination (GRE) prep courses, and others.

“Participation in research as an undergraduate is now viewed as an integral part of the undergraduate experience by university faculty, administrators, and future employers, especially in STEM fields, and has become an important consideration for entry to a graduate program in STEM. In addition, young faculty who were themselves participants in undergraduate research programs are now eager to share this opportunity with future generations.”

*From: Dalbotten, D., R. Haacker-Santos, S. Zurn-Birkhimer (2014):
New Voices: The Role of Undergraduate Geoscience Research in
Supporting Alternative perspectives on the Anthropocene. Future Earth
– Advancing Civic Understanding of the Anthropocene, Geophysical
Monograph 203, 2014*

6. Build in extra activities that help students excel: career development, writing workshops and poster workshops, field trips, research ethics discussions, community interactions, and opportunities for dissemination and community service.

Suggested checklist for planning your grant or existing REU

1. Consider the overall goals you have for running an REU program.

Some potential goals might be:

- » Diversifying your field
- » Supporting recruitment into your graduate programs
- » Creating strong partnerships with other institutions
- » Giving your faculty opportunities to mentor student research
- » Supporting an ongoing research program with additional funds or personnel (including the undergraduate workers)



2. Consider the overall theme of the program. What types of research projects do you want to do in the REU program?

- » Does the research theme provide good, doable research projects? Will they be team projects or individual projects?
- » Does the research provide a good mix of indoor and outdoor time? Field work and computer work? Will it be engaging to undergraduates?
- » Will undergraduate students have the capability of conducting the research or will they need additional training, and how time-intensive will that training be?

3. Consider institutional resources that will support the program

- » Contact other programs or your housing office to inquire about housing
- » Do you have access to support staff, libraries, laboratory spaces?
- » Insurance (clarify liability insurance)
- » Local environment (is it safe and does it offer activities for students in their off-hours?)



4. Institutional Partners

- » All partners should be involved in designing the REU from the proposal stage on
- » Have you talked to program partners about the REU and how they want to participate?
- » How do you work with community partners?

5. Model or structure of the program

- » What type of structure will you have, team work vs one-on-one mentoring?
- » How many students can you reasonably host and support?
- » Is it a traditional summer program? An international experience? A single-campus model or a dispersed model?

6. Budgets

- » What funds do you need to run this program effectively and safely?
- » What additional in-kind support will your institution provide to run the program?



➔ The GEO REU PI Network

As a manager or PI of a GEO REU you are invited to join a welcoming and supportive community of practice. The GEO REU PI Network is a community of people committed to providing high-quality geoscience research experiences for undergraduate students. The GEO REU Resource Center, housed at the National Center for Atmospheric Research, runs a listserv, holds quarterly telecons, shares resources on its website, and hosts education sessions at the annual fall meeting of the AGU in San Francisco, among other things.

[Join the GEO REU Listserv](#) to stay in touch about upcoming events (telecons, conferences), share resources, and have a go-to community where you can ask questions.

[Find resources, tips, and materials at the GEO REO Resource Center.](#)



Further Reading

Dalbotten, D., R. Haacker-Santos, S. Zurn-Birkhimer. 2014. *New Voices: The Role of Undergraduate Geoscience Research in Supporting Alternative Perspectives on the Anthropocene*. *Future Earth – Advancing Civic Understanding of the Anthropocene*, Geophysical Monograph 203.

National Research Council (NRC). 2012a. *New Research Opportunities in the Earth Sciences*. The National Academies Press, Washington, DC.

National Research Council (NRC). 2012b. *Community Colleges in the Evolving STEM Education Landscape: Summary of a Summit*. The National Academies Press, Washington, DC.



